The Potential for Canadian Branded Beef Steaks in the U.S. Market: Results from an Experimental Auction

Dillon M. Feuz
Professor, Department of Economics, Utah State University, Logan

Wendy J. Umberger
Lecturer, School of Agriculture, Food & Wine, University of Adelaide

Chris R. Calkins
Professor, Department of Animal Science, University of Nebraska–Lincoln

The Issue

The economic health of the Canadian beef industry is dependent upon exports. The U.S. market is the largest export market (over 70 percent of export volume) for Canadian beef. Imports of Canadian beef are equivalent to only about 4 percent of domestic U.S. production; however, many U.S. producers believe imports are having a negative impact on the market for domestic beef. They are disturbed that imported beef sold in the United States is not differentiated from domestic beef. The U.S. Congress passed legislation included in the 2002 U.S. Farm Bill creating a mandatory country-of-origin labeling (COOL) program for beef. The Canadian beef industry has viewed U.S. efforts to establish mandatory COOL as potentially having a negative effect on the market for Canadian beef and as a trade barrier; however, if some consumers preferred the taste of Canadian beef or felt that it was a superior product because of other product attributes, it could sell at a premium in the U.S. market.

Implications and Conclusions

Results of U.S. taste panels were that 28 percent of the panelists preferred the taste and were willing to pay a premium for Canadian beef over U.S. beef. Since Canadian beef imports to the United States are an amount equivalent to only 4 percent of domestic U.S. production, it appears there could be strong demand for branded Canadian beef in the U.S. market. These results were based on blind taste tests. The success of branded beef products depends upon reputation, trust in labeling claims, and satisfaction with expected and actual eating quality (Golan et al., 2004; Quagrainie, McCluskey and Loureiro, 2003). Consumers were not provided with information on origin or other attributes (e.g., traceability, production methods) that could be labeled on a branded product. Such information could change consumers' willingness to pay, positively or negatively, depending on the attributes valued most.

Background

In 2002, prior to the occurrence of any reported BSE cases in North America, Canada exported 363,453 tonnes of beef and veal to the United States. This amount represented 70 percent of Canada's total export volume. In 2005, Canada exported 370,742 tonnes of beef to the United States, which represented 81 percent of total exports (Agricultural and Agri-Food Canada, 2006). Over the five-year period from 2001 to 2005, Canada supplied about 31 percent of the total beef and veal imports into the United States; this 31 percent is an amount equivalent to 4 percent of U.S. domestic production (Livestock Marketing Information Center, 2006). While changes in the Canadian beef industry will have marginal impacts on the U.S. beef industry, clearly, changes in the U.S. beef industry will have major implications for the Canadian beef industry.

Traditionally U.S. consumers have purchased retail beef products with little knowledge of the origin of or methods used to produce and process the beef. USDA quality grades were used as indicators of beef carcass quality and in some cases were also available at the retail level. However, research findings show the average consumer doesn't understand how to use the information provided by quality grades to help them choose a palatable steak (Cox, McMullen and Garrad, 1990; Killinger et al., 2004). During the 1980s and early 1990s consumers became increasingly dissatisfied with the quality and consistency of beef products, and the beef industry lost market share to the poultry industry (Morgan et al., 1991). Various factors, including the commodity market mindset and the related industry structure, with a lack of consumer focus and coordination among sectors, played a role in the decline of beef demand (Purcell, 2002; Smith et al., 1995).

Over this same period, increasing per capita disposable income, changing lifestyles and health concerns led U.S. consumers' demand for beef and their definitions of beef quality to become more heterogeneous. In addition to traditional palatability factors (e.g.,

marbling and tenderness) consumers now demand more information about the production processes, origin and nutritional content of food products they purchase (Umberger, 2007). All of these factors now influence consumers' perceptions of beef quality. The beef industry has developed more coordinated and integrated supply chains, which focus on the specific attributes that matter most to their targeted consumer segments. These new consumer-driven supply chains are designed to provide producers with economic incentives to produce consistent, high-quality products that meet the market's changing expectations for beef products (Tatum et al., 2000).

Product labeling and branding strategies have become common in the beef industry, as they allow businesses to differentiate their products and to target the segments of consumers with interest in specific quality attributes. Wolf and Thulin (2000) found that in a survey of California consumers over 80 percent recognized the Harris Ranch label and one-third recognized the Certified Angus Beef label. Ward and Ferrara (2005) found that while the percentage of beef that was branded in 2000 was only 28 percent compared to 51 percent for pork and 80 percent for poultry, the percentage had increased from only 15 percent in 1992. As of June 30, 2006 the USDA had certified over 40 branded beef programs. A number of other brands also exist, including a plethora of store/retail brands. Most of branding programs have specifications on marbling and external fat thickness. Some are breed specific, e.g., Certified Hereford Beef, others are location specific, e.g., Nebraska Corn-fed Beef, and still others denote certain production practices, e.g., Coleman Natural Beef.

The U.S. Congress passed legislation included in the 2002 U.S. Farm Bill creating a mandatory COOL program. The 2002 COOL program included ground meat and muscle cuts from beef, lamb and pork as well as a number of other agricultural commodities (U.S. Senate Farm Bill Conference Framework, 2002). Mandatory COOL was scheduled to begin in 2004, but subsequent legislative actions have delayed funding and implementation of this law. Many U.S. producers continue to push for implementation of mandatory COOL. Conversely, the Canadian beef industry has viewed U.S. efforts to establish mandatory COOL of beef as potentially negative for the Canadian industry due to the costs of implementation and possible trade barriers (Umberger et al., 2003). Others have argued that mandatory COOL could actually help promote and increase U.S. demand for other countries' beef, if consumers view imported beef to be of relatively higher quality than domestic beef (Loureiro and Umberger, 2003; Umberger, 2004).

Any of the businesses presently marketing branded beef could also voluntarily include country-of-origin as part of their brand specification. For several years New Zealand has used COOL as a differentiated marketing strategy for lamb; more recently that country has done the same for beef. Promoting their products as "clean green" and promoting other production practices, New Zealand has built loyalty to the New Zealand country brand (Clemens and Babcock, 2004). Several studies have found that, on average, U.S. consumers preferred U.S. beef and desired COOL; however, consumers in these studies

and others have indicated that food safety, traceability and traditional meat quality attributes related to palatability (e.g., tenderness) are more important to consumers than COOL (Schupp and Gillespie, 2001; Umberger et al., 2003; Loureiro and Umberger, 2003, 2005). Research by Dickinson and Bailey (2002 and 2005) and Hobbs et al. (2005) documented consumers' willingness to pay for traceability and showed that consumers were even more willing to pay for traceability if it was bundled with quality assurances.

Liddell and Bailey (2001) and Schroeder (2003) have both suggested that Canada's beef industry is ahead of the U.S. beef industry in terms of traceability. Schroeder (2003) also noted that the Canadian beef industry's strengths are a more uniform supply of beef, strong food safety protocols and cattle being raised in a pristine environment.

One cannot forget, however, that the reputation of any branded beef program is dependent upon both consumers' trust in labeling claims and their satisfaction with expected and actual eating quality (Golan et al., 2004; Loureiro and McCluskey, 2000; Quagrainie, McCluskey and Loureiro, 2003). Perhaps the final, and certainly not the least important, attribute of Canadian beef is flavour. Can consumers perceive a unique flavour difference between Canadian barley-fed beef and U.S. corn-fed beef, and are they willing to pay a premium for their preferred flavour? The objectives of this research are to 1) compare consumer sensory ratings for paired samples of U.S. versus Canadian steaks; 2) determine consumers' willingness to pay for their preferred steak sample; and 3) identify the demographic profile of consumers with different taste preferences for the steaks.

Economic Model and Conceptual Framework

In June and July of 2002, a sample of consumers in Denver, Colorado and Chicago, Illinois were randomly screened and selected by telephone to participate in taste panels. Qualifying individuals (those willing to eat beef) were told they would have the opportunity to taste and to purchase New York strip beef steaks and would be paid $50 for two hours of their time. In total 24 taste panels were conducted, 12 in Denver and 12 in Chicago. After arriving at the research facility, consumers completed surveys describing their meat-purchasing behaviour, eating preferences, knowledge about beef and socio-demographic characteristics. Panelists were informed they would be tasting and rating pairs of steak samples for flavour, juiciness, tenderness and overall acceptability. Ratings were established using an eight-point hedonic scale (where 1 = extremely dry, extremely tough, extremely undesirable for flavour, extremely undesirable for overall acceptability, and where 8 = extremely juicy, extremely tender, extremely desirable for flavour, extremely desirable for overall acceptability).

Panelists were then informed they would have an opportunity to participate in an auction and to submit sealed bids (in $/pound of steak) for each steak sample in the pair. The procedures for a variant of the random *n*th-price auction (Shogren et al., 2001) were explained to participants, and they participated in three nonbinding, trial auctions on visually evaluated New York strip steaks to become familiar with the auction process.

After the practice auctions were completed, panelists were moved into individual tasting booths. They were given a warm-up steak sample to taste, rate and bid on (nonbinding). Panelists then tasted and evaluated both samples from a pair of steaks and simultaneously submitted bids ($/pound) for each sample in the pair. Participants were encouraged to bid exactly the amount they believed the product was worth to them and were reminded that if they "won" a binding auction they would be obligated to purchase the one-pound package of steaks at the auction market price. This research was part of a larger study designed to determine consumers' preferences for a variety of beef attributes; therefore, multiple auctions on paired samples of beef products were conducted. The current article focuses only on the U.S. versus Canadian paired comparison. Additional detail on the auction procedures can be found in Feuz et al. (2004).

For each of the paired steak samples every effort was made to standardize marbling score and tenderness level to isolate flavour differences that could be attributable to differences in production methods in the United States and Canada. Table 1 presents summary statistics on the paired steak samples used for this analysis. Of the 17 paired steak samples, 15 had sufficient marbling to be graded USDA upper two-thirds Choice, one paired sample was USDA low Choice and one paired sample had sufficient marbling to be graded USDA Prime. The comparable Canadian grades are Canada AAA for USDA Choice and Canada Prime for USDA Prime. In the United States, steaks with this level of marbling are usually sold in popular steakhouse restaurants or as premium labeled product in a glass retail case. Given the typical market outlet for this quality of beef, and the fact that much of it may already be sold as a branded, labeled product, if there are differences found in the flavour between U.S. and Canadian samples, then beef merchants should be able to label the beef as U.S. corn-fed or Canadian barley-fed and market it to those consumers who have a preference for one flavour over the other.

Table 1 Statistics for Characteristics of U.S. versus Canadian Paired Steak Samples (n = 17 pairs)

Product characteristics		U.S. samples	Canadian samples	Paired differences
Marbling score:[a]	average	404	403	1
	minimum	270	250	-60
	maximum	520	550	60
WBSF:[b]	average	3.05	3.05	0.00
	minimum	2.38	2.37	-0.23
	maximum	4.49	4.22	0.27
Fat percent		10.27	8.62	1.65
Water content percent		69.05	70.85	-1.80

[a] Marbling score: 200-290 is USDA low Choice and Canada AAA; 300-490 is USDA upper 2/3 Choice and Canada AAA; 500-790 is USDA Prime and Canada Prime.
[b] Warner-Bratzler shear force measured in kilograms is the amount of force necessary for a fixed blade to shear through a cooked sample of meat (Shackelford et al.).

The four sensory ratings of flavour, juiciness, tenderness and overall acceptability were compared and tested for significant differences between the U.S. and Canadian samples. Since the ratings were established using an eight-point hedonic scale it is not appropriate to compare the mean values using standard parametric procedures. The nonparametric Sign Test (Ostle and Malone, 1988) was used to test for differences between palatability ratings for U.S. versus Canadian steak samples. Additionally, the difference in each of the panelist's bids for the U.S. and Canadian samples was calculated by subtracting the panelist's bid for the Canadian steak sample from his or her bid for the U.S. steak sample. The hypothesis of no differences in average bids for the U.S. and Canadian steaks, versus the alternative hypothesis of a significant difference in average bids, was tested using a standard paired means test.

The panelists were divided into three groups based on differences in their overall acceptability ratings for the pair of steaks: 1) prefer U.S., for those panelists whose overall acceptability rating for the U.S. sample was greater than their rating for the Canadian sample; 2) prefer Canadian, for those panelists whose rating for the U.S. sample was lower than their rating for the Canadian sample; and 3) indifferent, for those panelists whose rating for the U.S. sample was equal to their rating for the Canadian sample. The differences in sensory ratings and bids were determined for each of these groups and are displayed in table 2.

From a marketing perspective, firms are interested not only in the percentage of the population that prefers a certain flavour of steak and is willing to pay a premium for that flavour, but also in understanding the factors influencing the individuals within each market segment. The detailed demographic information collected on each panelist was used to estimate the impact of demographics on panelists' preferences for U.S. steak:

(1) $PREFERUS_i = \alpha_0 + \beta_1 AGE_i + \beta_2 INCOME_i + \beta_3 EDUCATION_i + \beta_4 GENDER_i + \beta_5 ETHNIC_i + \beta_6 BEEF_i + \varepsilon_i,$

where the dependent variable *PREFERUS* is the *i*th (i = 1-194) panelist's preference for U.S. corn-fed steak over Canadian barley-fed steak, and is based on the difference between the panelist's overall acceptability ratings for the U.S. steak sample and the Canadian steak sample. If the *i*th panelist's overall acceptability rating for the U.S. steak sample exceeds that panelist's acceptability rating for the Canadian steak sample, then *PREFERUS* is set equal to 1; otherwise, it is set equal to 0. The independent variable *INCOME* is a real, continuous variable used to indicate the panelist's annual household income. *GENDER* and *ETHNIC* are 0/1 dummy variables indicating the *i*th panelist was female/male and Caucasian/non-Caucasian. *AGE, EDUCATION* and *BEEF* are categorical variables indicating the panelist's age range, level of education and frequency of weekly beef consumption, respectively; higher numbers in each case indicate the panelist is older, more highly educated or consumes beef more frequently. Parameter estimates for equation 1 were estimated using a binomial choice probit model in LIMDEP (Greene, 2002).

Table 2 Panelists' Mean Sensory Ratings and Bids for U.S. versus Canadian
Beef Steaks, for all Consumers and by Consumer Segments

	U.S.	Canadian	Paired differences[a]
Overall sample (n = 194 consumers/panelists)			
flavour	6.04	5.71	0.32**
juiciness	5.58	5.40	0.19
tenderness	5.71	5.39	0.32
overall acceptability	5.88	5.52	0.36**
bid	$3.76	$3.47	$0.29
Consumer segment: prefer U.S. (44% of consumers/panelists)			
flavour	6.60	5.21	1.40**
juiciness	6.16	4.79	1.37**
tenderness	6.27	4.66	1.60**
overall acceptability	6.55	4.84	1.71**
bid	$4.20	$2.84	$1.36**
Consumer segment: prefer Canadian (28% of consumers/panelists)			
flavour	5.09	6.20	-1.11**
juiciness	4.69	5.96	-1.28**
tenderness	4.80	6.02	-1.22**
overall acceptability	4.76	6.19	-1.43**
bid	$3.10	$4.28	$-1.18**
Consumer segment: indifferent (28% of consumers/panelists)			
flavour	6.07	6.02	0.06
juiciness	5.56	5.80	-0.24*
tenderness	5.72	5.91	-0.19**
overall acceptability	5.93	5.93	0.00
bid	$3.74	$3.69	$0.05

[a] Significance determined for categorical variables using the Sign Test. Significance at the α = 0.05 and 0.01 level is indicated by * and **, respectively.

In addition to understanding how demographic measures affect consumers' steak preferences, it is also interesting to understand how they translate into value differences for steaks. Thus, the following equation was estimated to determine the effect of these same demographic variables on differences in the participants' willingness to pay between the two steak samples:

(2) $\text{BIDDIF}_{ij} = \alpha_0 + \beta_1\text{AGE}_i + \beta_2\text{INCOME}_i + \beta_3\text{EDUCATION}_i + \beta_4\text{GENDER}_i$
$+\beta_5\text{ETHNIC}_i +\beta_6\text{BEEF}_i +\beta_7\text{FLAVOURDIF}_{ij} + \beta_8\text{OVERALLDIF}_{ij} + \varepsilon_i ,$

where *BIDDIF* is the ith panelist's bid differential between the steak samples in the jth U.S. and Canadian pair, in US$/pound. *FLAVOURDIF* and *OVERALLDIF* are the differences between the ith panelist's categorical sensory ratings for flavour and overall acceptability of the steak samples in jth U.S. and Canadian pair. Umberger and Feuz (2004) have

shown that bid differentials in experimental auctions for closely related products are primarily explained by panelists' perceptions of product quality. The other variables are as previously defined in equation 1. *BIDDIF* is a real, continuous variable, and equation 2 was estimated using OLS regression.

Analysis

Consumer panelists could taste a significant difference between Canadian barley-fed steaks and U.S. corn-fed steaks when marbling and tenderness were controlled within paired samples. On average, after tasting samples in blind taste tests, the panelists preferred the U.S. steaks (table 2), rating their flavour and overall acceptability significantly higher than those of the Canadian steaks in paired comparisons. Furthermore, panelists' bids were nominally higher for the U.S. samples compared to their bids for the Canadian samples, but the average difference in bids was not significant. While the average panelist ratings for flavour and overall acceptability seem to suggest that all consumers preferred the U.S. steak, in fact less than half of the panelists (44 percent) preferred and were willing to pay a premium (of 48 percent) for the U.S. steak samples (table 2). Conversely, 28 percent of the panelists preferred and were willing to pay a 38 percent premium for the Canadian steak samples (table 2). Another 28 percent of the consumers were indifferent between the U.S. and Canadian steaks, based on the fact that there were no differences in their overall acceptability ratings.

    Equations 1 and 2 were estimated in an attempt to predict the types of consumers who might be more likely to prefer or be willing to pay a premium for the U.S. or the Canadian steak. Table 3 contains summary statistics for each of the variables. There were no *a priori* expectations as to how the demographic variables might influence the dependent variables; however, we did expect strong positive relationships between *FLAVOURDIF* and *BIDDIF* and between *OVERALLDIF* and *BIDDIF*. A number of alternative model

Table 3 Summary Statistics for the Variables Used in Equations 2 and 3

Variable	Mean	Standard deviation	Range
BIDDIF ($/pound)	0.287	2.0672	-7.50 to 8.50
PREFERUS	0.443	0.4981	0/1
OVERALLDIF	0.361	1.5112	-5 to 5
FLAVOURDIF	0.325	1.5245	-5 to 4
AGE	6.088	2.0071	1 to 10
GENDER	0.273	0.4467	0/1
ETHNIC	0.155	0.3625	0/1
EDUCATION	4.860	1.3487	1 to 8
INCOME ($/annum)	70,108.70	27,693	20,000 to100,000
BEEF	1.974	0.8171	1 to 5

Table 4 Probit and OLS Results from Estimations of Equations 2 and 3

	Probit model Equation 2: *PREFERUS*	OLS model Equation 3: *BIDDIF*
Constant	0.0708 (0.4021)	-1.0028* (0.4277)
AGE	-0.0314 (0.0471)	-0.0022 (0.0017)
INCOME	-0.0000 (0.0000)	-0.0000 (0.0000)
EDUCATION	0.0025 (0.0057)	0.0002 (0.0017)
GENDER	0.1251 (0.2102)	0.3358 (0.2766)
ETHNIC	-0.2205 (0.2588)	-0.2711 (0.3431)
BEEF	0.0082 (0.1137)	0.1236 (0.1515)
FLAVOURDIF		0.2420 (0.1328)
OVERALLDIF		0.5856* (0.1341)
Adjusted R-squared		33.63
Chi-squared	4.397	87.74*

* Denotes significance at the α = 0.05 level. Standard errors are in parentheses.

specifications and econometric procedures were used to estimate equation 1, and in all cases demographics were of no significant value in predicting preferences (*PREFERUS)* for U.S. corn-fed steaks over Canadian barley-fed steaks (table 4).

   Similarly, demographics were of no significant value in predicting bid differentials between the U.S. corn-fed steaks and the Canadian barley-fed steaks (table 4). However, bid differentials (*BIDDIF*) were significantly and positively influenced by the differential in the overall acceptability rating *(OVERALLDIF)* between the paired samples. While *FLAVOURDIF* had the expected sign, it was not statistically significant. Panelists' ratings for flavour and overall acceptability were highly correlated (0.80). This is not surprising, as the overall acceptability rating is also likely to contain information on a panelist's perception of flavour and thus is the "best" predictor of differences in bids. Figure 1 illustrates the relationship between the categorical overall acceptability ratings and the average bids for U.S. and Canadian steak samples. Consumers who rate a product as being more acceptable on all beef palatability attributes appear to place a higher value on the
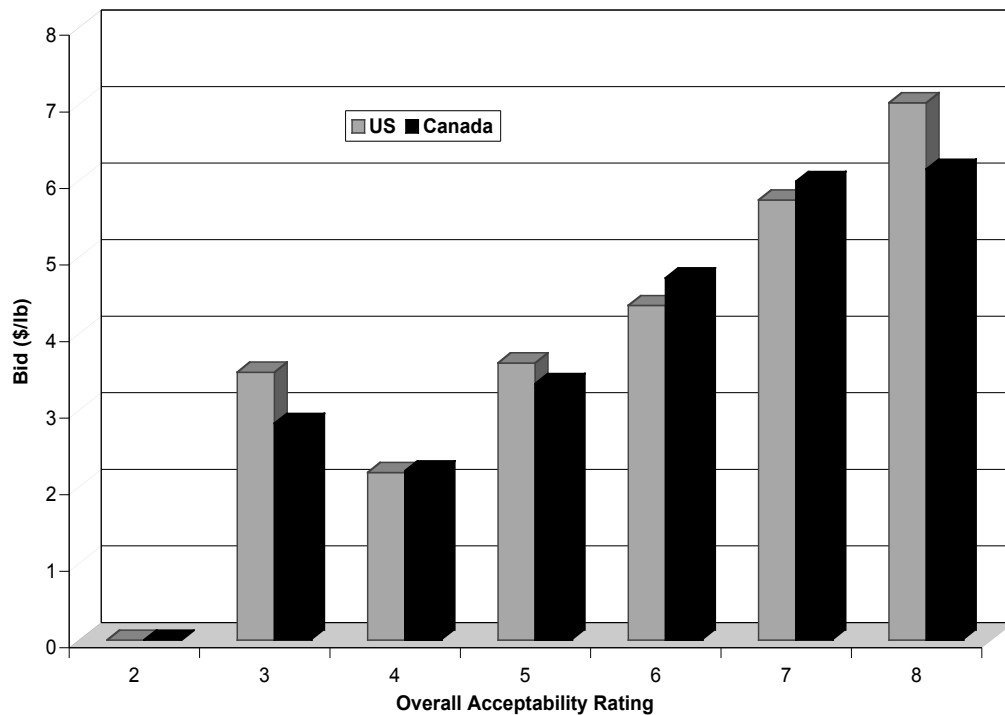
Figure 1 Average bids for U.S. and Canadian steak samples by overall acceptability ratings.

product; consequently, they are willing to pay more for products with perceived higher eating quality.

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